RFP-1325.02 (REV. 5/97)
Previously RF-46522

CORRES. CONTROL
INCOMING LTR NO.
01267 RF 97

DUE DATE
ACTION

25 AUG 97 11:13 - RFETS-CC-

Department of Energy

ROCKY FLATS FIELD OFFICE
P.O. BOX 928
GOLDEN, COLORADO 80402-0928

97-DOE-05372

AUG 21 1997

DIST.	LTR	ENC
BACON, R.F.		
BENSUSSEN, S.J.		
BRAILSFORD, M.D		
BUHL, T.R.		
BURDGE, L		
CARD, R.G.	X	X
COSGROVE, M. M.,		
COULTER, W.L.		
CRAWFORD, A.C.,		
DERBY, S.		
DIETERLE, S.E.		
FERRERA, D.W.		
GERMAIN, A.L.		
HARDING, W.A.		
HARROUN, W.P.		
HEDAHL, T.G.		
HERRING, C.L.		
HILL, J.A.	X	X
MARTINEZ, L.A.		
NORTH, K.		
OGG, R.N.		
PARKER, A.	X	X
PHILLIPS, F.J.		
RHOADES, D.W.		
RUSCITTO, D.G.		
SANDLIN, N.B.		
SPEARS, M.S.		
TILLER, R. E.		
TUOR, N.R.		
VOORHEIS, G.M.		
Shelton, D.	X	X

COR. CONTROL	X	X
ADMN. RECORD	X	X
PATS/T130G		

Reviewed for Addressee
Corres. Control RFP
8/25/97 JK
Date By

Ref Ltr. #

DOE ORDER #

Mr. Steve Tarlton
Manager, Rocky Flats Program
Colorado Department of Public Health and Environment
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530

Mr. Tim Rehder
U.S. Environmental Protection Agency, Region VIII
999 18th Street, Suite 500, 8EPR-FT
Denver, Colorado 80202-2405

Gentlemen:

Enclosed please find the draft of the 1997 Rocky Flats Cleanup Agreement Annual Review.

Should you have any questions regarding this matter please contact Sean Bell at extension 5226.

Sincerely,

John C. Morris

for Steven W. Slaten
RFCA Project Coordinator

Enclosure

cc w/enc:
Administrative Record

cc w/o enc:
B. April, RLG, RFFO
J. Morris, RLG, RFFO
D. Shelton, K-H

Draft

1997 Regulatory/Radionuclide Soil Action Levels
Rocky Flats Cleanup Agreement
Annual Review
August 1997

1.0 Background

The Rocky Flats Cleanup Agreement (RFCA or Agreement) was signed by the Department of Energy (DOE), the Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE) on July 19, 1996. The RFCA Parties have committed to review the agreement to determine if any revisions are necessary. Paragraph 5 of RFCA states:

The Parties shall conduct an annual review of all applicable new and revised statutes and regulations and written policy and guidance to determine if an amendment pursuant to Part 19 (Amendment of Agreement) is necessary.

In addition to the annual review prescribed in paragraph 5 of RFCA, the agencies committed to conducting an internal annual review of the radionuclide soil action levels. An annual report summarizing the review will be given to the public. Questions to be addressed on an annual basis include:

1. Is there new scientific information available that would impact the interim action levels?

2. Has a national soil action level been promulgated within the year? If yes, the parties commit to revisit Rocky Flats' interim action levels.

3. How were the interim action levels applied to the site over the course of the year?

4. Have the remedies been effective?

(See, Responsiveness Summary for Soil Action Levels released on November 6, 1996.)

This report is a summary of the Parties 1997 regulatory/radionuclide soil action levels annual review.

What the Parties reviewed this year

The 1997 Regulatory/Radionuclide Soil Action Level Annual Review covered the period from July 19, 1996 through July 1, 1997. The following environmental laws, and associated regulations, written policy and guidance, were reviewed:

Comprehensive Environmental Response Compensation and Liability Act ;
Resource Conservation and Recovery Act/Colorado Hazardous Waste Act;
Toxic Substances Control Act;
Clean Water Act;
Clean Air Act;
National Environmental Policy Act;
Ecology (e.g., Endangered Species Act); and
Radiation.

In addition to the above environmental laws and the radionculide soil action levels, the Action Levels and Standards Framework for Surface Water, Ground Water, and Soils and the Preliminary Programmatic Remediation Goals (PPRGs) were reviewed.

What the Parties did not review this year

The RFCA Implementation Guidance Document, the Integrated Monitoring Plan, and the Community Relations Plan are commitments within RFCA that will normally be reviewed during the annual review process; however, because these documents were not finalized by July 19, 1997, they were not included as part of this review.

II. Public Participation

The public was invited to submit any new information relevant to the RFCA or soil action levels at a public meeting held on June 2, 1997 or by written comments which were accepted by the agencies through June 27, 1997. Attachment 1 is a responsiveness summary to comments the Parties received to the 1997 annual review.

III. Environmental Statutes

As stated above, the following environmental laws were reviewed: Comprehensive Environmental Response Compensation and Liability Act (CERCLA); Resource Conservation and Recovery Act (RCRA/Colorado Hazardous Waste Act (CHWA); Toxic Substances Control Act (TSCA); Clean Water Act (CWA); Clean Air Act (CAA); National Environmental Policy Act (NEPA); Ecology (e.g., Endangered Species Act); and Radiation. Questions which were addressed for each area during the review were:

1. Are there any new or revised statutes, regulations, written policy, or guidance?

2. Has the change been implemented at the site? Does it need to be implemented?

3. Does the change impact RFCA and is an amendment required?

Based on the review, no new or revised statutes, regulations, written policy or guidance were identified as final from July 19, 1996 to July 1, 1997 which impacted RFCA or required an amendment. On July 21, 1997, the Nuclear Regulatory Commission issued a final rule on Radiological Criteria for License Termination. For more information, see the discussion below under Radionuclide Soil Action Levels.

The Preble's Meadow Jumping Mouse was proposed for listing on the Threatened and Endangered Species List by the U.S. Fish and Wildlife Service. No change to RFCA is required at this time.

IV. RFCA Attachment 5: Action Levels and Standards Framework for Surface Water, Ground Water and Soils

The Action Levels and Standards Framework for Surface Water, Ground Water, and Soils (ALF) were reviewed to determine if there were any changes to standards or action levels that may require a change to the document. Changes to the original ALF were made on October 18, 1997 to reflect the

final radionuclide soil action levels. Additionally, the ALF was updated to reflect the Water Quality Control Commission Hearing held in December, 1996.

ALF uses Maximum Contaminant Levels (MCLs) for surface water where no specific standard is available and also uses MCLs as a basis for ground water action levels. The MCLs were reviewed to determine if there were any changes in the MCL values which would impact ALF. No changes were made which impact ALF.

ALF uses PPRGs for surface water and ground water when no MCL is available. A review of toxicity factors was undertaken to determine if EPA had issued any changes to the toxicity factors which would impact the PPRG calculation and the changes are included in Attachment 2.

In addition, RFETS, CDPHE, and EPA risk assessors are reviewing the office worker scenario and VOCs inhalation as a pathway. Any impacts to PPRGS and associated changes to ALF will be incorporated into the 1998 RFCA Annual Review.

V. Radionuclide Soil Action Levels (RSALs)

1. Is there new scientific information available that would impact the interim action levels?

The derivation of the RSALs was based on a number of distinct steps. These steps consisted of performing a regulatory analysis, followed by developing a site conceptual model for RFETS and finally, selecting a computer model to derive the RSALs and determining the appropriate input parameters for the model. For a discussion on new regulations, see section V.2 below.

A Site Conceptual Model (SCM) based on site-specific conditions at RFETS was developed for the derivation of RSALs. The SCM was based on the future land uses at RFETS with their associated exposure scenarios, the exposure pathways associated with the exposure scenarios, the soil types associated with the exposure pathways, the radionuclide types found at RFETS and the exposure pathway-specific radiation dose conversion factors. The factors used for the SCM have not changed since the RSALs were derived. Consequently, the SCM used to derive the RSALs is still appropriate.

The RESRAD computer model was used in the original derivation of the RSALs. There have been updates to the RESRAD computer model during the past year; however, the parties do not believe that these updates impact the original derivation of the RSALS. Consequently, the selection of the RESRAD computer model used to derive the RSALs is still appropriate. RFETS recognizes the need for continuing study of actinide migration and its potential impact on short and long-term surface water quality. Actinide specialists continue to investigate the fate and transport of actinides. No new information is available which will impact RFCA.

2. Has a national soil action level been promulgated within the year? If yes, the parties commit to revisit Rocky Flats' interim action levels.

On July 21, 1997, a final rule from the Nuclear Regulatory Commission (NRC), 10 CFR Part 20, Radiological Criteria for License Termination, was published in the Federal Register. Although intended for License Termination at NRC licensed facilities, and therefore not currently binding on DOE facilities, the rule may be appropriate for use in guiding cleanup at Rocky Flats. This rule was not reviewed as part of the annual review since it was finalized after the close of the annual review

period. However, the issuance of the rule is assumed by the RFCA parties to be related to soil action levels and decommissioning levels and is being evaluated.

3. How were the interim action levels applied to the site over the course of the year?

T3/T4

The source removal at T3/T4 was prompted by the presence of VOCs in levels exceeding Tier I values and contributing to ground water contamination. Interim action radionuclide levels were applied to the soil that was put back following treatment of VOCs. Rad levels were not applied to excavated debris because all debris was removed from the trenches and packaged for disposal as low-level waste. Treated soil was screened for rad levels and segregated. Of the 3,500 cubic yards treated, 40 cubic yards were packaged for off-site disposal either for logistical reasons or because it exceeded the Tier I level for rads, and 200 cubic yards were between Tier I and Tier II values and were placed in Trench T-4 and surrounded by geotextile. The location of the geotextile was surveyed and documented. The remainder of soil was below the Tier II values and placed back in the trenches.

Mound

The source removal at the Mound Site was prompted by the presence of VOCs in levels exceeding Tier I values and contributing to ground water contamination. Interim action radionuclide levels will be applied to the soil that is to be put back following treatment. Soil was screened as it was excavated and is all well below the Tier II levels and will be put back without the need for segregation.

IHSS 119.1

The final OU1 CAD/ROD specified a source removal through excavation at IHSS 119.1. Through preliminary investigation with a geoprobe, soil samples indicated that rad values were well below the Tier II levels. It also indicated that the VOCs were not localized and that excavation is not warranted.

4. Have the remedies been effective?

Since the removals at Ryan's Pit, T3/T4, and Mound, monitoring of ground water has continued. Due to the low hydraulic conductivity's of the Rocky Flats alluvium, it is too early to know the effectiveness of the remedies for VOC contamination.

Attachment 1

Responsiveness Summary for Comments
to the 1997
Regulatory/Radionuclide Soil Action Level Annual Review

Comments:

The removal of the foundations of building which obstruct the natural flow of underground streams at the site will have an effect on the present ground water flow. A request was made to construct a conceptual model to determine the impact of foundation removal on ground water flows and that the model become part of the RFCA.

Response

The purpose of the Agreement was to establish the regulatory framework for achieving the ultimate cleanup of the site. As part of the framework, a process was established for developing, implementing, and monitoring appropriate response actions at the site and to ensure that such actions are conducted in accordance with CERCLA, RCRA, CHWA, and other applicable State and Federal environmental laws. As such, a conceptual model developed to determine the impact of foundation removal on ground water flows would not become part RFCA. However, considerations for such conceptual model could be included in the ground water model developed as part of the Accelerating Cleanup: Focus on 2006 Plan.

Comment:

The City of Westminster requested that it's concerns for contaminated ground water impact on Standley Lake and Woman Creek Reservoir be archived for incorporation into the final Record of Decision for the RFETS.

Response:

The City of Westminster's concerns are documented as part of this report; consequently, since this report will be included in the administrative record for the site, the concerns will be reviewed as part of the final Record of Decision process. In addition, the City of Westminster will have further opportunities to raise its concerns during public comment periods of future actions, annual reviews and the final Record of Decision.

Comment:

Members of the public expressed continued concern over the interim soil action levels for radionuclides set for the cleanup of the site. Requests were made in support of having the interim soil action levels for radionuclides and computer modeling used to generate action levels reviewed by nationally known experts.

Response:

Comment noted.

Attachment 1

Comment:

A recommendation was made that the Parties find new ways to incorporate impacted communities more effectively in the consultative process. One suggestion was to expand the scope of participation in formal discussions, scoping activities, training, and overall implementation.

Response:

Comment noted.

The Parties are continually seeking new ways to better communicate and to have more effective consultative process. However, there are times when meeting between the Parties without members of the public present are appropriate. In the future, the Parties will let impacted communities know the outcome of such meetings and when and how the impacted communities may become involved in any discussions they are currently not involved in. Please note that participation may involve attendance at daytime meeting and some work in getting into technical detail.

Comment:

A recommendation was made to utilize the Rocky Flats WEB page as an additional central source for obtaining many of the cleanup decision-making documents, including those commissioned by the contractors to support the 2006 Plan.

Response:

The site is continually looking for ways to better communicate including, means to share information regarding cleanup decision-making documents that are available and how copies may be obtained if including them on the WEB page is not possible.

Comment:

Innovative technologies are not specifically referenced in the RFCA. How will a technology development program help to accelerate to improve RFCA implementation?

Response:

A technology development program may help the site find new technologies which could accelerate decommissioning and cleanup in new ways that are even safer and more protective of human health and the environment than current technologies. The success of such technologies may assist the Parties in the implementation of RFCA by the successful closure of RFETS.

The Programmatic Risk-Based Preliminary Remediation Goals (PPRGs) were updated to incorporate changes in toxicity factors used in their calculation. Toxicity factors for all chemicals in the PPRG list were reviewed using the lastest updates to the Environmental Protection Agencies' Health Effects Summary Tables (HEAST) and Integrated Risk Information System (IRIS) and other relevant guidance. All changes have been incorporated into the attached PPRG Summary Table and sources documented in footnotes.

The following chemicals had toxicity values revised; arsenic, cadmium, carbon disulfide, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,1-dicloroethene, manganese, Aroclor-1221, -1232, -1242, -1248, -1254, -1260, uranium-233+D, and uranium-238+D. Five chemicals were added to the PPRG list due to new toxicity values that were not previously available: amonium, 2,4-dinitrotoluene, 4-methylphenol, 2-nitroaniline, and aroclor-1016.

PROGRAMMATIC PRELIMINARY RISK-BASED REMEDIATION GOALS FOR RFETS

Target Analyte List Chemical	Residential Groundwater (mg/L)	Residential Surface Water Swimming (mg/L)	Residential Soil (mg/kg)	Office Worker Soil (mg/kg)	Construction Worker Subsurface Soil (mg/kg)	Wading Ecological Worker (mg/L)	Soil Ecological Worker (mg/kg)	Open Space Surface Water (mg/L)	Open Space Soil/Sediment (mg/kg)
Acenaphthene#	2.19E+00	1.68E+03	1.65E+04	1.23E+05	1.06E+05	2.55E+03	2.22E+05	2.04E+03	4.61E+05
Acenaphthylene#	-	-	-	-	-	-	-	-	-
Acetone#	3.65E+00	2.81E+03	2.74E+04	2.04E+05	1.77E+05	4.26E+03	3.71E+05	3.41E+03	7.68E+05
Aldrin	5.00E-06	3.85E-03	3.77E-02	3.36E-01	7.30E+00	7.01E-02	6.10E+00	4.68E-03	1.03E+00
Aluminum	1.06E+02	8.14E+04	7.96E+05	5.93E+06	5.15E+06	1.23E+05	1.08E+07	9.88E+04	2.23E+07
Anthracene#	1.10E+01	8.42E+03	8.23E+04	6.13E+05	5.32E+05	1.28E+04	1.11E+06	1.02E+04	2.30E+06
Antimony	1.46E-02	1.12E+01	1.10E+02	8.18E+02	7.10E+02	1.70E+01	1.48E+03	1.36E+01	3.07E+03
Aroclor-1016	4.25E-05	3.28E-02	3.20E-01	2.86E+00	6.21E+01	5.96E-01	5.19E+01	3.97E-02	8.95E+00
Aroclor-1221	4.25E-05	3.28E-02	3.20E-01	2.86E+00	6.21E+01	5.96E-01	5.19E+01	3.97E-02	8.95E+00
Aroclor-1232	4.25E-05	3.28E-02	3.20E-01	2.86E+00	6.21E+01	5.96E-01	5.19E+01	3.97E-02	8.95E+00
Aroclor-1242	4.25E-05	3.28E-02	3.20E-01	2.86E+00	6.21E+01	5.96E-01	5.19E+01	3.97E-02	8.95E+00
Aroclor-1248	4.25E-05	3.28E-02	3.20E-01	2.86E+00	6.21E+01	5.96E-01	5.19E+01	3.97E-02	8.95E+00
Aroclor-1254	4.25E-05	3.28E-02	3.20E-01	2.86E+00	3.55E+01	5.96E-01	5.19E+01	3.97E-02	8.95E+00
Aroclor-1260	4.25E-05	3.28E-02	3.20E-01	2.86E+00	6.21E+01	5.96E-01	5.19E+01	3.97E-02	8.95E+00
Arsenic	5.67E-05	4.37E-02	4.27E-01	3.81E+00	8.28E+01	7.95E-01	6.92E+01	5.30E-02	1.17E+01
Barium	2.56E+00	1.97E+03	1.91E+04	1.41E+05	1.24E+05	2.98E+03	2.60E+05	2.38E+03	5.35E+05
Benzene#	6.17E-04	2.26E+00	2.21E+01	1.97E+02	1.33E+03	4.11E+01	3.58E+03	2.74E+00	6.17E+02
alpha-BHC	1.35E-05	1.04E-02	1.02E-01	9.08E-01	1.97E+01	1.89E-01	1.65E+01	1.26E-02	2.78E+00
beta-BHC	4.72E-05	3.64E-02	3.56E-01	3.18E+00	6.90E+01	6.62E-01	5.77E+01	4.42E-02	9.75E+00
delta-BHC	-	-	-	-	-	-	-	-	-
gamma-BHC (Lindane)	6.54E-05	5.04E-02	4.93E-01	4.40E+00	9.55E+01	9.17E-01	7.98E+01	6.11E-02	1.38E+01
Benzo(a)anthracene	1.16E-04	8.97E-02	8.77E-01	7.84E+00	1.70E+02	1.63E+00	1.42E+02	1.09E-01	2.45E+01
Benzo(a)pyrene	1.16E-05	8.97E-03	8.77E-02	7.84E-01	1.70E+01	1.63E-01	1.42E+01	1.09E-02	2.45E+00
Benzo(b)fluoranthene	1.16E-04	8.97E-02	8.77E-01	7.84E+00	1.70E+02	1.63E+00	1.42E+02	1.09E-01	2.45E+01
Benzo(g,h,i)perylene	-	-	-	-	-	-	-	-	-
Benzo(k)fluoranthene	1.16E-03	8.97E-01	8.77E+00	7.84E+01	1.70E+03	1.63E+01	1.42E+03	1.09E+00	2.45E+02
Benzoic Acid	1.46E+02	1.12E+05	1.10E+06	8.18E+06	7.10E+06	1.70E+05	1.48E+07	1.36E+05	3.07E+07
Benzyl Alcohol	1.10E+01	8.42E+03	8.23E+04	6.13E+05	5.32E+05	1.28E+04	1.11E+06	1.02E+04	2.30E+06
Beryllium	1.98E-05	1.52E-02	1.49E-01	1.33E+00	2.89E+01	2.77E-01	2.41E+01	1.85E-02	4.08E+00
bis(2-Chloroethoxy)methane#	-	-	-	-	-	-	-	-	-
bis(2-Chloroethyl)ether#	1.63E-05	5.95E-02	5.82E-01	5.20E+00	1.13E+02	1.08E+00	9.43E+01	7.23E-02	1.63E+01
bis(2-Chloroisopropyl)ether#	4.22E-04	9.36E-01	9.15E+00	8.17E+01	1.77E+03	1.70E+01	1.48E+03	1.14E+00	2.56E+02

PROGRAMMATIC PRELIMINARY RISK-BASED REMEDIATION GOALS FOR RFETS

Target Analyte List Chemical	Residential Groundwater (mg/L)	Residential Surface Water Swimming (mg/L)	Residential Soil (mg/kg)	Office Worker Soil (mg/kg)	Construction Worker Subsurface Soil (mg/kg)	Wading Ecological Worker (mg/L)	Soil Ecological Worker (mg/kg)	Open Space Surface Water (mg/L)	Open Space Soil/Sediment (mg/kg)
bis(2-Ethylhexyl)phthalate	6.07E-03	4.68E+00	4.57E+01	4.09E+02	8.87E+03	8.51E+01	7.41E+03	5.68E+00	1.28E+03
Bromodichloromethane#	1.37E-03	1.06E+00	1.03E+01	9.23E+01	2.00E+03	1.92E+01	1.67E+03	1.28E+00	2.89E+02
Bromoform#	3.77E-03	8.29E+00	8.11E+01	7.24E+02	1.14E+04	1.51E+02	1.31E+04	1.01E+01	2.27E+03
Bromomethane#	1.09E-02	3.93E+01	3.84E+02	2.86E+03	2.48E+03	5.96E+01	5.19E+03	4.77E+01	1.08E+04
4-Bromophenyl phenyl ether	-	-	-	-	-	-	-	-	-
2-Butanone#	2.47E+00	1.68E+04	1.65E+05	1.23E+06	1.06E+06	2.55E+04	2.22E+06	2.04E+04	4.61E+06
Butylbenzylphthalate	7.30E+00	5.62E+03	5.49E+04	4.09E+05	3.55E+05	8.52E+03	7.42E+05	6.81E+03	1.54E+06
Cadmium	1.83E-02	1.40E+01	2.74E+02	2.04E+03	1.77E+03	2.13E+01	3.71E+03	1.70E+01	7.68E+03
Calcium	-	-	-	-	-	-	-	-	-
Carbon disulfide#	1.27E+00	2.81E+03	2.74E+04	2.04E+05	1.77E+05	4.26E+03	3.71E+05	3.41E+03	7.68E+05
Carbon tetrachloride#	2.60E-04	5.04E-01	4.93E+00	4.40E+01	3.70E+02	9.17E+00	7.98E+02	6.11E-01	1.38E+02
Cesium	-	-	-	-	-	-	-	-	-
alpha-Chlordane	6.54E-05	5.04E-02	4.93E-01	4.40E+00	9.55E+01	9.17E-01	7.98E+01	6.11E-02	1.35E+01
beta-Chlordane	6.54E-05	5.04E-02	4.93E-01	4.40E+00	9.55E+01	9.17E-01	7.98E+01	6.11E-02	1.35E+01
gamma-Chlordane	6.54E-05	5.04E-02	4.93E-01	4.40E+00	9.55E+01	9.17E-01	7.98E+01	6.11E-02	1.35E+01
4-Chloroaniline	1.46E-01	1.12E+02	1.10E+03	8.18E+03	7.10E+03	1.70E+02	1.48E+04	1.36E+02	3.07E+04
Chlorobenzene#	5.16E-02	5.62E+02	5.49E+03	4.09E+04	9.17E+03	8.52E+02	7.42E+04	6.81E+02	1.54E+05
Chloroethane#	2.78E+01	-	-	-	1.04E+06	-	-	-	-
Chloroform#	2.76E-04	1.07E+01	1.05E+02	9.38E+02	5.68E+02	1.95E+02	1.70E+04	1.30E+01	2.93E+03
Chloromethane#	2.32E-03	5.04E+00	4.93E+01	4.40E+02	9.55E+03	9.17E+01	7.98E+03	6.11E+00	1.38E+03
4-Chloro-3-methylphenol	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene#	2.92E+00	2.25E+03	2.20E+04	1.64E+05	1.42E+05	3.41E+03	2.97E+05	2.73E+03	6.14E+05
2-Chlorophenol#	1.83E-01	1.40E+02	1.37E+03	1.02E+04	8.87E+03	2.13E+02	1.85E+04	1.70E+02	3.84E+04
4-Chlorophenyl phenyl ether	-	-	-	-	-	-	-	-	-
Chromium III	3.65E+01	2.81E+04	2.74E+05	2.04E+06	1.77E+06	4.26E+04	3.71E+06	3.41E+04	7.68E+06
Chromium VI	1.83E-01	1.40E+02	9.39E+02	4.86E+03	8.87E+03	2.13E+02	1.85E+04	1.70E+02	3.67E+04
Chyrsene	1.16E-02	8.97E+00	8.77E+01	7.84E+02	1.70E+04	1.63E+02	1.42E+04	1.09E+01	2.45E+03
Cobalt	2.19E+00	1.68E+03	1.65E+04	1.23E+05	1.06E+05	2.55E+03	2.22E+05	2.04E+03	4.61E+05
Copper	1.46E+00	1.12E+03	1.10E+04	8.18E+04	7.10E+04	1.70E+03	1.48E+05	1.36E+03	3.07E+05
Cyanide	7.30E-01	5.62E+02	5.49E+03	4.09E+04	3.55E+04	8.52E+02	7.42E+04	6.81E+02	1.54E+05
4,4-DDD	3.54E-04	2.73E-01	2.67E+00	2.38E+01	5.17E+02	4.97E+00	4.32E+02	3.31E-01	7.46E+01
4,4-DDE	2.50E-04	1.93E-01	1.88E+00	1.68E+01	3.65E+02	3.51E+00	3.05E+02	2.34E-01	5.26E+01
4,4-DDT	2.50E-04	1.93E-01	1.88E+00	1.68E+01	3.65E+02	3.51E+00	3.05E+02	2.34E-01	5.16E+01

PROGRAMMATIC PRELIMINARY RISK-BASED REMEDIATION GOALS FOR RFETS

Target Analyte List Chemical	Residential Groundwater (mg/L)	Residential Surface Water Swimming (mg/L)	Residential Soil (mg/kg)	Office Worker Soil (mg/kg)	Construction Worker Subsurface Soil (mg/kg)	Wading Ecological Worker (mg/L)	Soil Ecological Worker (mg/kg)	Open Space Surface Water (mg/L)	Open Space Soil/Sediment (mg/kg)
Dibenz(a,h)anthracene	1.16E-05	8.97E-03	8.77E-02	7.84E-01	1.70E+01	1.63E-01	1.42E+01	1.09E-02	2.45E+00
Dibenzofuran	-	-	-	-	-	-	-	-	-
Dibromochloromethane	1.01E-03	7.80E-01	7.62E+00	6.81E+01	1.48E+03	1.42E+01	1.24E+03	9.46E-01	2.13E+02
Di-n-butylphthalate	3.65E+00	2.81E+03	2.74E+04	2.04E+05	1.77E+05	4.26E+03	3.71E+05	3.41E+03	7.68E+05
1,2-Dichlorobenzene#	3.48E-01	2.53E+03	2.47E+04	1.84E+05	1.60E+05	3.83E+03	3.34E+05	3.07E+03	6.91E+05
1,3-Dichlorobenzene#	-	-	-	-	-	-	-	-	-
1,4-Dichlorobenzene#	3.54E-03	2.73E+00	2.67E+01	2.38E+02	5.17E+03	4.97E+01	4.32E+03	3.31E+00	7.46E+02
3,3-Dichlorobenzidine	1.89E-04	1.46E-01	1.42E+00	1.27E+01	2.76E+02	2.65E+00	2.31E+02	1.77E-01	3.98E+01
1,1-Dichloroethane#	1.01E+00	2.81E+03	2.74E+04	2.04E+05	5.30E+04	4.26E+03	3.71E+05	3.41E+03	7.68E+05
1,2-Dichloroethane#	1.97E-04	7.20E-01	7.04E+00	6.29E+01	4.12E+02	1.31E+01	1.14E+03	8.74E-01	1.97E+02
1,1-Dichloroethene#	6.77E-05	1.09E-01	1.07E+00	9.53E+00	7.30E+01	1.99E+00	1.73E+02	1.32E-01	2.98E+01
1,2-Dichloroethene (total)#	3.29E-01	2.53E+02	2.47E+03	1.84E+04	1.60E+04	3.83E+02	3.34E+04	3.07E+02	6.91E+04
2,4-Dichlorophenol	1.10E-01	8.42E+01	8.23E+02	6.13E+03	5.32E+03	1.28E+02	1.11E+04	1.02E+02	2.30E+04
1,2-Dichloropropane#	1.25E-03	9.63E-01	9.42E+00	8.41E+01	1.83E+03	1.75E+01	1.53E+03	1.17E+00	2.63E+02
cis-1,3-Dichloropropene#	1.27E-04	3.64E-01	3.56E+00	3.18E+01	5.32E+02	6.62E+00	5.77E+02	4.42E-01	9.94E+01
trans-1,3-Dichloropropene#	1.27E-04	3.64E-01	3.56E+00	3.18E+01	5.32E+02	6.62E+00	5.77E+02	4.42E-01	9.94E+01
Dieldrin	5.31E-06	4.09E-03	4.00E-02	3.57E-01	7.76E+00	7.45E-02	6.49E+00	4.97E-03	1.10E+00
Diethylphthalate	2.92E+01	2.25E+04	2.20E+05	1.64E+06	1.42E+06	3.41E+04	2.97E+06	2.73E+04	6.14E+06
2,4-Dimethylphenol#	7.30E-01	5.62E+02	5.49E+03	4.09E+04	3.55E+04	8.52E+02	7.42E+04	6.81E+02	1.54E+05
Dimethylphthalate	3.65E+02	2.81E+05	2.74E+06	2.04E+07	1.77E+07	4.26E+05	3.71E+07	3.41E+05	7.68E+07
4,6-Dinitro-2-methylphenol#	-	-	-	-	-	-	-	-	-
2,4-Dinitrophenol	7.30E-02	5.62E+01	5.49E+02	4.09E+03	3.55E+03	8.52E+01	7.42E+03	6.81E+01	1.54E+04
2,4-Dinitrotoluene	1.28E-04	9.85E-02	9.63E-01	8.60E+00	1.87E+02	1.79E+00	1.56E+02	1.20E-01	2.69E+01
2,6-Dinitrotoluene	1.28E-04	9.85E-02	9.63E-01	8.60E+00	1.87E+02	1.79E+00	1.56E+02	1.20E-01	2.69E+01
Di-n-octylphthalate	7.30E-01	5.62E+02	5.49E+03	4.09E+04	3.55E+04	8.52E+02	7.42E+04	6.81E+02	1.54E+05
Endosulfan I	2.19E-01	1.68E+02	1.65E+03	1.23E+04	1.06E+04	2.55E+02	2.22E+04	2.04E+02	4.61E+04
Endosulfan II	2.19E-01	1.68E+02	1.65E+03	1.23E+04	1.06E+04	2.55E+02	2.22E+04	2.04E+02	4.61E+04
Endosulfan sulfate	2.19E-01	1.68E+02	1.65E+03	1.23E+04	1.06E+04	2.55E+02	2.22E+04	2.04E+02	4.61E+04
Endosulfan (technical)	-	-	-	-	-	-	-	-	-
Endrin ketone	1.10E-02	8.42E+00	8.23E+01	6.13E+02	5.32E+02	1.28E+01	1.11E+03	1.02E+01	2.30E+03
Endrin (technical)	1.58E+00	2.81E+03	2.74E+04	2.04E+05	1.48E+05	4.26E+03	3.71E+05	3.41E+03	7.68E+05
Ethylbenzene#	1.46E+00	1.12E+03	1.10E+04	8.18E+04	7.10E+04	1.70E+03	1.48E+05	1.36E+03	3.07E+05
Fluoranthene									

PROGRAMMATIC PRELIMINARY RISK-BASED REMEDIATION GOALS FOR RFETS

Target Analyte List Chemical	Residential Groundwater (mg/L)	Residential Surface Water Swimming (mg/L)	Residential Soil (mg/kg)	Office Worker Soil (mg/kg)	Construction Worker Subsurface Soil (mg/kg)	Wading Ecological Worker (mg/L)	Soil Ecological Worker (mg/kg)	Open Space Surface Water (mg/L)	Open Space Soil/Sediment (mg/kg)
Fluorene#	1.46E+00	1.12E+03	1.10E+04	8.18E+04	7.10E+04	1.70E+03	1.48E+05	1.36E+03	3.07E+05
Heptachlor	1.89E-05	1.46E-02	1.42E-01	1.27E+00	2.76E+01	2.65E-01	2.31E+01	1.77E-02	3.90E+00
Heptachlor epoxide	9.34E-06	7.20E-03	7.04E-02	6.29E-01	1.36E+01	1.31E-01	1.14E+01	8.74E-03	1.93E+00
Hexachlorobenzene	5.31E-05	4.09E-02	4.00E-01	3.57E+00	7.76E+01	7.45E-01	6.49E+01	4.97E-02	1.10E+01
Hexachlorobutadiene	1.09E-03	8.40E-01	8.21E+00	7.33E+01	3.55E+02	8.52E+00	7.42E+02	1.02E+00	2.25E+02
Hexachlorocyclopentadiene	2.56E-01	1.97E+02	1.91E+03	1.42E+04	1.24E+04	2.98E+02	2.60E+04	2.38E+02	5.36E+04
Hexachloroethane	6.07E-03	4.68E+00	4.57E+01	4.09E+02	1.77E+03	4.26E+01	3.71E+03	5.68E+00	1.25E+03
2-Hexanone#	-	-	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	1.16E-04	8.97E-02	8.77E-01	7.84E+00	1.70E+02	1.63E+00	1.42E+02	1.09E-01	2.45E+01
Iron	-	-	-	-	-	-	-	-	-
Isophorone	8.95E-02	6.89E+01	6.74E+02	6.02E+03	1.31E+05	1.25E+03	1.09E+05	8.37E+01	1.88E+04
Lead	-	-	400 [a]	1000 [b]	-	-	-	-	-
Lithium	7.30E-01	5.62E+02	5.49E+03	4.09E+04	3.55E+04	8.52E+02	7.42E+04	6.81E+02	1.54E+05
Magnesium	-	-	-	-	-	-	-	-	-
Manganese	1.72E+00	1.32E+03	3.31E+04	8.78E+04	8.20E+04	2.00E+03	1.74E+05	1.60E+03	3.48E+05
Mercury	1.10E-02	8.42E+00	8.23E+01	6.13E+02	5.32E+02	1.28E+01	1.11E+03	1.02E+01	2.31E+03
Methoxychlor	1.83E-01	1.40E+02	1.37E+03	1.02E+04	8.87E+03	2.13E+02	1.85E+04	1.70E+02	3.84E+04
Methylene chloride#	6.22E-03	8.73E+00	8.54E+01	7.63E+02	1.66E+04	1.59E+02	1.38E+04	1.06E+01	2.39E+03
2-Methylnaphthalene#	-	-	-	-	-	-	-	-	-
4-Methyl-2-pentanone#	2.07E-01	2.25E+03	2.20E+04	1.64E+05	1.42E+05	3.41E+03	2.97E+05	2.73E+03	6.14E+05
2-Methylphenol	1.83E+00	1.40E+03	1.37E+04	1.02E+05	8.87E+04	2.13E+03	1.85E+05	1.70E+03	3.84E+05
4-Methylphenol	1.83E-01	1.40E+02	1.37E+03	1.02E+04	8.87E+03	2.13E+02	1.85E+04	1.70E+02	3.84E+04
Molybdenum	1.83E-01	1.40E+02	1.37E+03	1.02E+04	8.87E+03	2.13E+02	1.85E+04	1.70E+02	3.84E+04
Naphthalene#	1.46E+00	1.12E+03	1.10E+04	8.18E+04	7.10E+04	1.70E+03	1.48E+05	1.36E+03	3.07E+05
Nickel	7.30E-01	5.62E+02	5.49E+03	4.09E+04	3.55E+04	8.52E+02	7.42E+04	6.81E+02	1.54E+05
2-Nitroaniline	-	-	-	4.07E+06	2.01E+07	-	-	-	-
3-Nitroaniline	-	-	-	-	-	-	-	-	-
4-Nitroaniline	-	-	-	-	-	-	-	-	-
Nitrobenzene#	4.25E-03	1.40E+01	1.37E+02	1.02E+03	8.87E+02	2.13E+01	1.85E+03	1.70E+01	3.84E+03
2-Nitrophenol	-	-	-	-	-	-	-	-	-
4-Nitrophenol#	-	-	-	-	-	-	-	-	-
n-Nitrosodiphenylamine#	1.73E-02	1.34E+01	1.31E+02	1.17E+03	2.53E+04	2.43E+02	2.12E+04	1.62E+01	3.65E+03
n-Nitrosodipropylamine	1.21E-05	9.36E-03	9.15E-02	8.17E-01	1.77E+01	1.70E-01	1.48E+01	1.14E-02	2.56E+00

PROGRAMMATIC PRELIMINARY RISK-BASED REMEDIATION GOALS FOR RFETS

Target Analyte List Chemical	Residential Groundwater (mg/L)	Residential Surface Water Swimming (mg/L)	Residential Soil (mg/kg)	Office Worker Soil (mg/kg)	Construction Worker Subsurface Soil (mg/kg)	Wading Ecological Worker (mg/L)	Soil Ecological Worker (mg/kg)	Open Space Surface Water (mg/L)	Open Space Soil/Sediment (mg/kg)
Pentachlorophenol	7.08E-04	5.46E-01	5.34E+00	4.77E+01	1.03E+03	9.93E+00	8.65E+02	6.62E-01	1.49E+02
Phenanthrene#	-	-	-	-	-	-	-	-	-
Phenol	2.19E+01	1.68E+04	1.65E+05	1.23E+06	1.06E+06	2.55E+04	2.22E+06	2.04E+04	4.61E+06
Potassium	-	-	-	-	-	-	-	-	-
Pyrene	1.10E+00	8.42E+02	8.23E+03	6.13E+04	5.32E+04	1.28E+03	1.11E+05	1.02E+03	2.30E+05
Selenium	1.83E-01	1.40E+02	1.37E+03	1.02E+04	8.87E+03	2.13E+02	1.85E+04	1.70E+02	3.84E+04
Silver	1.83E-01	1.40E+02	1.37E+03	1.02E+04	8.87E+03	2.13E+02	1.85E+04	1.70E+02	3.84E+04
Sodium	-	-	-	-	-	-	-	-	-
Strontium	2.19E+01	1.68E+04	1.65E+05	1.23E+06	1.06E+06	2.55E+04	2.22E+06	2.04E+04	4.61E+06
Stryene#	2.01E+00	5.62E+03	5.49E+04	4.09E+05	2.04E+05	8.52E+03	7.42E+05	6.81E+03	1.54E+06
1,1,2,2-Tetrachloroethane#	8.95E-05	3.28E-01	3.20E+00	2.86E+01	6.21E+02	5.96E+00	5.19E+02	3.97E-01	8.95E+01
Tetrachloroethene#	1.43E-03	1.26E+00	1.23E+01	1.10E+02	2.21E+03	2.29E+01	2.00E+03	1.53E+00	3.44E+02
Thallium	-	-	-	-	-	-	-	-	-
Tin	2.19E+01	1.68E+04	1.65E+05	1.23E+06	1.06E+06	2.55E+04	2.22E+06	2.04E+04	4.61E+06
Toluene#	9.65E-01	5.62E+03	5.49E+04	4.09E+05	1.16E+05	8.52E+03	7.42E+05	6.81E+03	1.54E+06
Toxaphene	7.73E-05	5.95E-02	5.82E-01	5.20E+00	1.13E+02	1.08E+00	9.43E+01	7.23E-02	1.59E+01
1,2,4-Trichlorobenzene#	2.20E-01	2.81E+02	2.74E+03	2.04E+04	1.77E+04	4.26E+02	3.71E+04	3.41E+02	7.68E+04
1,1,1-Trichloroethane#	-	-	-	-	-	-	-	-	-
1,1,2-Trichloroethane#	3.18E-04	1.15E+00	1.12E+01	1.00E+02	2.18E+03	2.09E+01	1.82E+03	1.39E+00	3.14E+02
Trichloroethene#	2.54E-03	5.95E+00	5.82E+01	5.20E+02	5.10E+03	1.08E+02	9.43E+03	7.23E+00	1.63E+03
2,4,5-Trichlorophenol	3.65E+00	2.81E+03	2.74E+04	2.04E+05	1.77E+05	4.26E+03	3.71E+05	3.41E+03	7.68E+05
2,4,6-Trichlorophenol	7.73E-03	5.95E+00	5.82E+01	5.20E+02	1.13E+04	1.08E+02	9.43E+03	7.23E+00	1.59E+03
Vanadium	2.56E-01	1.97E+02	1.92E+03	1.43E+04	1.24E+04	2.98E+02	2.60E+04	2.38E+02	5.38E+04
Vinyl acetate	3.65E+01	2.81E+04	2.74E+05	2.04E+06	1.77E+06	4.26E+04	3.71E+06	-	7.68E+06
Vinyl chloride#	2.81E-05	3.45E-02	3.37E-01	3.01E+00	2.08E+01	6.27E-01	5.46E+01	4.18E-02	9.42E+00
Xylene (total)#	7.30E+01	5.62E+04	5.49E+05	4.09E+06	3.55E+06	8.52E+04	7.42E+06	6.81E+04	1.54E+07
Zinc	1.10E+01	8.42E+03	8.23E+04	6.13E+05	5.32E+05	1.28E+04	1.11E+06	1.02E+04	2.30E+06
	-	-	-	-	-	-	-	-	-
Nitrate	5.84E+01	4.49E+04	4.39E+05	3.27E+06	2.84E+06	6.81E+04	5.93E+06	5.45E+04	1.23E+07
Nitrite	3.65E+00	2.81E+03	2.74E+04	2.04E+05	1.77E+05	4.26E+03	3.71E+05	3.41E+03	7.68E+05
Sulfide	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-
Ammonium	3.54E+01	2.72E+04	2.66E+05	1.98E+06	1.72E+06	4.13E+04	3.60E+06	3.30E+04	7.45E+06
Bicarbonate	-	-	-	-	-	-	-	-	-

PROGRAMMATIC PRELIMINARY RISK-BASED REMEDIATION GOALS FOR RFETS

Target Analyte List Chemical	Residential Groundwater (mg/L)	Residential Surface Water Swimming (mg/L)	Residential Soil (mg/kg)	Office Worker Soil (mg/kg)	Construction Worker Subsurface Soil (mg/kg)	Wading Ecological Worker (mg/L)	Soil Ecological Worker (mg/kg)	Open Space Surface Water (mg/L)	Open Space Soil/Sediment (mg/kg)
Bromide	-	-	-	-	-	-	-	-	-
Carbonate	-	-	-	-	-	-	-	-	-
Chloride	-	-	-	-	-	-	-	-	-
Fluoride	2.19E+00	1.68E+03	1.65E+04	1.23E+05	1.06E+05	2.55E+03	2.22E+05	2.04E+03	4.61E+05
Orthophosphate	-	-	-	-	-	-	-	-	-
Silica (as Si and SiOšd2›)	-	-	-	-	-	-	-	-	-
Sulfate	-	-	-	-	-	-	-	-	-
	(pCi/L)	(pCi/L)	(pCi/g)	(pCi/g)	(pCi/g)	(pCi/L)	(pCi/g)	(pCi/L)	(pCi/g)
Americium-241	1.45E-01	1.12E+02	1.90E+00	7.67E+00	1.64E+02	2.03E+03	1.10E+02	1.36E+02	2.36E+01
Cesium-137+D	1.51E+00	1.16E+03	1.99E-02	7.97E-02	1.59E+00	2.11E+04	6.38E-01	1.41E+03	7.97E-02
Plutonium-239	1.51E-01	1.16E+02	2.50E+00	1.01E+01	2.19E+02	2.11E+03	1.83E+02	1.41E+02	6.98E+01
Plutonium-240	1.51E-01	1.16E+02	2.51E+00	1.01E+01	2.20E+02	2.12E+03	1.83E+02	1.41E+02	6.98E+01
Radium-226+D	1.61E-01	1.24E+02	6.17E-03	2.47E-02	4.94E-01	2.25E+03	1.98E-01	1.50E+02	2.47E-02
Radium-228+D	1.92E-01	1.48E+02	1.27E-02	5.06E-02	1.01E+00	2.69E+03	4.06E-01	1.79E+02	5.08E-02
Strontium-89	4.62E+00	3.56E+03	3.86E+01	1.55E+02	3.23E+03	6.47E+04	1.72E+03	4.31E+03	2.71E+02
Strontium-90+D	8.52E-01	6.55E+02	1.42E+01	5.72E+01	1.24E+03	1.19E+04	1.04E+03	7.95E+02	3.98E+02
Tritium	6.66E+02	5.12E+05	1.11E+04	4.48E+04	9.71E+05	9.32E+06	8.12E+05	6.22E+05	3.11E+05
Uranium-233+D	1.06E+00	8.18E+02	1.73E+01	6.97E+01	1.52E+03	1.49E+04	1.24E+03	9.92E+02	4.46E+02
Uranium-234)	1.07E+00	8.25E+02	1.75E+01	7.08E+01	1.55E+03	1.50E+04	1.27E+03	1.00E+03	4.67E+02
Uranium-235+D	1.01E+00	7.79E+02	1.56E-01	6.23E-01	1.25E+01	1.42E+04	5.01E+00	9.46E+02	6.28E-01
Uranium-238+D	7.68E-01	5.91E+02	6.04E-01	2.42E+00	4.85E+01	1.08E+04	1.99E+01	7.17E+02	2.52E+00

= Chemicals listed are volatile.

All toxicity values used in calculations are from IRIS, February 1994, from HEAST, 1994, or approved by the EAOC..

[a] U.S. Environmental Protection Agency (USEPA). 1994. *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities.* Office of Solid Waste and Emergency Response, Washington, D.C. Directive 9355.4-12.

[b] IUBK Model, U.S. Environmental Protection Agency (USEPA). 1996. Region IX Preliminary Remediation Goals (PRGs) 1996. Region IX, San Francisco, CA 94105, August 1.